A.D. 1850 . . . . . N° 13,061.

SPECIFICATION

OF

PIERRE ARMAND LE COMTE DE FONTAINE MOREAU.

APPARATUS AND ARRANGEMENTS FOR CONDUCTING, COLLECTING, AND PURIFYING THE SMOKE ARISING FROM PUBLIC AND PRIVATE BUILDINGS.

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DE FONTAINE MOREAU'S SPECIFICATION.

TO ALL TO WHOM THESE PRESENTS SHALL COME, I, Pierre Armand Le Comte de Fontaine Moreau, of 4, South Street, Finsbury, London, English and Foreign Office for Patents of Inventions, send greeting.

WHEREAS Her present most Excellent Majesty Queen Victoria, by Her Royal Letters Patent under the Great Seal of the United Kingdom of Great Britain and Ireland, bearing date at Westminster, the Twenty-third day of April (One thousand eight hundred and fifty), in the thirteenth year of Her reign, did, for Herself, Her heirs and successors, give and grant unto me, the said Pierre Armand Lecomte de Fontaine Moreau, my ex̃ors, adm̃ors, and assigns, Her especial licence, full power, sole privilege, and authority, that I, the said Pierre Armand Lecomte de Fontaine Moreau, my ex̃ors, adm̃ors, and assigns, or such others as I, the said Pierre Armand Lecomte de Fontaine Moreau, my ex̃ors, adm̃ors, or assigns, should at any time agree with, and no others, from time to time and at all times during the term of years therein expressed, should and lawfully might make, use, exercise, and vend, within England, Wales, and the Town of Berwick upon Tweed, and in the Islands of Guernsey, Jersey, Alderney, Sark, and Man, and also in all Her said Majesty's Colonies and Plantations abroad, the Invention of "**A New and Improved Mode of Conducting, Consuming, and Disengaging Smoke from its Deleterious Components**," communicated to me from abroad; in which said Letters Patent is contained a proviso, that I, the said Pierre Armand Lecomte de Fontaine Moreau, should cause a particular description of the nature of the said Inven-

tion, and in what the same is to be performed, by an instrument in writing under my hand and seal to be inrolled in Her said Majesty's High Court of Chancery within six calendar months next and immediately after the date of the said in part recited Letters Patent, as in and by the same, reference being thereunto had, will more fully and at large appear.

NOW KNOW YE, that in compliance with the said proviso, I, the said Pierre Armand Lecomte de Fontaine Moreau, do hereby declare the nature of the said Invention communicated to me, and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement thereof, reference being had to the Drawing hereunto annexed, and to the figures and letters therein contained (that is to say):—

The Invention communicated to me consists in gathering and extracting from all private, public, and other buildings the smoke of fires, and in conducting it, by means of underground pipes, to general reservoirs, where it is consumed and disengaged from ammoniacal compounds and deleterious gases, whence it is sent out into the air inodorous and colourless.

The evils arising from the aggregation of vast and dense clouds of smoke over large towns and cities has for a long while demanded that some efficient means should be employed to obtain their complete dispersion. It will be useless to dwell on that imperious necessity, though it will not be too much to say that London would be considered the finest city in the world if its atmosphere were not ever loaded with a thick, heavy, and yellow canopy, arising from the immense quantity of smoke too dense to be scattered even by the winds. By the new and improved mode herein-after described, of conducting, consuming, disinfecting, and dispelling the smoke and ammoniacal products and deleterious gases arising from the burning of coals, the laws of natural philosophy, conjointly with some of the means already put in practice, on account of their simplicity and efficiency, and which have supported the test of long experience, have been taken as bases; it is therefore by means of the three herein-after described improvements that the important results already pointed out are obtained. Firstly, to determine the draught of each separate fire, in order to carry away the smoke; secondly, to gather the smoke in a general reservoir; thirdly, to consume the smoke when accumulated, and to separate it from its deleterious components.

First Improvement.

To determine the draught of each separate fire, in order to carry away the smoke. The first improvement comports in itself many others, which, although

they may be considered of a secondary order, are nevertheless of the utmost importance; because their operation require that a chimney should never smoke,—that the sweeping be very easily effected,—that the conduct pipes be used as heat conductors,—that the first outlay be small, and be largely repaid by the economy in heating the dwellings already constructed,—that the outlay for a new construction be far less than the masonry works necessary for the conduct of smoke until now employed. It is also necessary to regulate the draught of each chimney, as well as that of the principal conduct pipes of the buildings, to clear out the soot coming from each dwelling, and to produce a good heat conductor at a very small cost. These results are obtained in houses already constructed, and also in those to be erected, by the application of pipes receiving the smoke as it egresses from each fire, and conducting it into a pipe which descends into the subterranean parts of the dwellings, where an apparatus for separating the soot is purposely set. Figure 1 in Drawing I. represents a section and plan of an old and also of a new house without chimney. They are provided with iron pipes, having the registers *a*, *a*, acted upon by the hand *c*, to receive the smoke egressing from each hearth to conduct it to a receiving tube with a register *b*, set in the lower part of the building, where the apparatus for separating the soot is placed. A register *c* allows the smoke to be received in the main pipe set in the street. Figure I[a] is two sectional elevations of *c*, *c*[1], and *a*, *b*, of Figure 1, and represents the pipes of the main street tube. Figure 2 represents a plan of the external place where the smoke gathered from the severel buildings is accumulated; the dotted lines represent the main conduct pipes passing through the streets of a town or part of a town up to the main apparatus set in the suburb. A, Figure 3, is a horizontal section or plan, which is level with the ground, and represents the complete main working apparatus for consuming the smoke; in that Figure *a*, *a*, shew the draught register in connection with the main street pipes. A are accessory buildings, which can serve as baracks or other public buildings; B is the reservoir for condensing; C, the large draught chimney; D, D, the rooms where the working machinery is set; E, the room for the ventilators. Figure IV. is a sectional elevation of the plan, Figure 3. Figure 5 is the canals of condensation, according to the line of Figure 3. Figure 6 represents a section of the canals connected with the ventilation and draught chimney, according to the line A, B, of Figure 3.

Drawing II. represents in detail the several apparatus for conducting the smoke and gases from buildings and houses into the main street pipes. In that Drawing, Figure 1 is a longitudinal section, according to *c*, *d*, of Figure 1, Drawing I., of an old dwelling-house. Figure 2 is a sectional elevation according

to *a*, *b*, of Figure 1, Drawing I.; that Figure represents the chimnies of the apartments. The old flues for the smoke and the opening for the egress of heat are represented by dotted lines. Figure 3 is a section, according to *a*, *b*, of Figure 1, Drawing I., and represents two chimneys, set one against the other. In that Figure the tubes of each chimney are represented branching into the main conduct pipe, which descends through the old flue of the lower chimney of the dwelling, and reaches the apparatus for separating the smoke, placed in the underground part of the house where the soot is deposited, and from which the smoke egresses into the main street pipes. In these three Figures the same letters of reference represent parts which are similar. *a*, *b*, *c*, *d*, are the plates by which the old flues of chimneys are shut, and through which, however, the external air penetrates to be heated, and enters the apartments. *e* is the register of the apparatus for the separation of the soot and for regulating the draught. *f*, f^1, *g*, g^1, *h*, h^1, registers, serving to modify or suppress the draught in each room; *j*, *j*, *j*, *j*, openings for the egress of the external air into the appartments when heated by its contact with the pipes. In the herein-before described arrangements, represented by Figures 1, 2, and 3, of Drawing II., to apply the new system to old houses, the chimneys are employed to conduct the smoke pipes, by which means these said pipes are rendered heating chambers or calorifers; but in the houses to be constructed purposely for the application of this Invention, and represented by Figures 4, 5, and 6 of the same Drawing H, the main smoke conduct pipe is made to pass through the dining-room or parlour where stoves may be erected, the construction of which serves for the application of this improved system. In the above three last Figures the same letters of reference represent parts which are similar; *a*, *b*, *c*, *d*, *e*, *f*, represent the valves serving to modify or to suppress the draught of the apartments, and *g* is the valve of the apparatus for separating the soot, and serves to regulate the draught. The Figures 4, 5, and 6 are sections through *c*, *d*, *a*, *b*, and *e*, *f*, of the Figure 1, Drawing I.; each room where there is a chimney communicates with the next apartment, by means of an opening through which the heat is made to egress. By that new mode of setting the draught, the chimney of the upper story can be employed to heat a whole house by regulating the valves set in each room, and that of the apparatus of separation; in that case, however, it is merely necessary to shut the hearths of the other rooms by means of the registers, with which the pipes, as herein-before described, are provided.

The apparatus for separating the soot, and which is represented in Figures 1, 2, 3, 4, 5, and 6, Drawing II., several times in section and elevation, is composed, firstly, of a cylindrical box, ending like a truncated cone, the

smallest basis of which receives the pipe conducting the smoke; secondly, of a cone, having its upper extremity bent towards the ingress of the smoke, and having the axis in the same direction as those of the pipes conducting the smoke from the chimney, and those of the pipes by which it egresses into the main street pipes: this cone forces the soot to fall round these last pipes; thirdly, of an egress pipe, having the shape of an inverted ⊥, to facilitate the sweeping of a pipe when it is foul; fourthly, of a door, to allow the sweeping of the apparatus. From what has been herein described, it will be seen that the construction of houses already built is but very slightly modified; and besides, that the whole of the heat which is lost in common chimneys is sent back into the interior of the apartment by means of branch caloric pipes; it is therefore competent to say that they serve as calorifers. It is a known fact that the ordinary fire-places utilise only one-fifth of the heat developed by the combustion of a body, whilst, by the application of the present system, the use of the calorifer herein-before described would utilise four-fifths of the caloric developed by the combustion of every kind of fuel, which thus alone effects a saving or rather a gain of three-fifths of the heat in favor of the present mode. New buildings will be more elegantly built, the roof better and more closely constructed, and more easily kept in repair, and the whole architectural appearance will be preserved without being spoiled by the ugly sight of chimney tops.

The speed of the draught for the smoke in the fire-places has been calculated at nearly twenty-six feet per second, which corresponds to the maximum draught which takes place when the temperature of the gases in the chimneys has reached six hundred and thirty-six degrees Fahrenheit, according to well known experiments.

Second Improvement.

To determine the general draught of the smoke. For this part of the Invention, it is necessary, after having found the velocity required by experiment for burning the fuel in such a manner so as to determine a good draught, to obtain thus that velocity, which velocity, as stated before, has been laid down at twenty-six feet per second; that improvement is obtained by the following rules:---Firstly, that for ventilating coal mines in which the air circulates through numerous galleries, the length of which extends sometimes to thirty thousand feet, the same air is forced in by means of a fire placed at one hundred and sixty to two hundred, or even three hundred and thirty feet, from the mouth of the mine, and from the open atmosphere, or by means of ventilators

placed outside of the mine; secondly, on the great velocity given to the air by means of bellows in high furnaces, and which is determined by a very small difference of pressure; thirdly, on the escape of gases; and, finally, by means of the laws of natural philosophy in their several applications; and by applying the above results, which experience has consecrated, there will be no difficulty in the construction of general draught chimneys, and in their elevation from three hundred to three hundred and twenty feet, as represented in Drawings I., III., IV., and V. The smoke reaching (by means of canals or conducts herein-after described) at the base of these main chimneys will be at first subjected to the powerful action of ventilators, and afterwards to that of a fire, where the carbonic gases produced by the distillation of the coals in each separate fire of the several dwellings will be removed (the gases produced by these separate fires not having suffered complete combustion); after that operation they will be ejected into the air through the main chimneys three hundred feet high. If London be taken for the application of the present system, the following calculations will serve as a basis for every other city.

The population of London alone is calculated at one million five hundred thousand persons, or about five inhabitants per fire, that is to say, three hundred thousand fires, for the service of which five main chimneys will be constructed, therefore each of them would receive the smoke of sixty thousand chimneys of dwelling-houses; but as generally only two-thirds of that number have fires at the same time, the smoke of forty thousand chimneys only will consequently reach a main chimney. Each private stove consumes commonly about one pound of coal per hour, and admitting according to well known experiments, that about fifty-nine cubic feet $(1 \times x)$ of gas is developed at the egress from the stove per two pounds of burnt coal, it follows that per each pound of about twenty-nine and a half cubic feet of gas or smoke, or one thousand nine hundred and eighty-one gallons of smoke per hour, passes through a flue, which per second is $\frac{15849}{3600}$ pints, or four and a half pints. Let us admit five pints of gas or smoke per fire and per second.

It is well to observe that the temperature of the smoke in the flues is at thirty-one degrees Fahrenheit; the calculation would give nearly thirty-one feet per pound of burnt coal. Those calculations are sufficiently approximate to permit to fix at twenty-nine feet per pound and per second as the velocity of the smoke. The velocity of egress for the smoke being twenty-six feet per second, as herein-before stated, this formula will be quite sufficient for the calculations relating to the conduct pipes.

V (the volume) = S (the section) × V (the velocity) :—

Number of Chimnies served by a Pipe.	Number of Pipes uniting in a single one in the Street.	Volume of Pints flowing per Second into a Pipe.	Section of the Pipes V S = V.	Diameter of the Conduct Pipes.
1	100	5¼ pints	0·0164 feet	0·262 feet
100	5	528 ,,	0·123 ,,	0·688 ,,
500	5	2640 ,,	0·618 ,,	1·608 ,,
2,500	4	1320 ,,	3·089 ,,	3·591 ,,
10,000	2	52,800 ,,	12·303 ,,	6·855 ,,
20,000	2	105,600 ,,	24·264 ,,	10·168 ,,
40,000	Main chimney.	211,200 ,,	49·856 ,,	14·334 ,,

The first diameter, that of the pipes of dwelling houses, is much larger than that given by the calculation, because those pipes receive the hot gases and soot, whilst the conduit pipes of the streets receive merely the cold gases, free in great part from the soot, as it can be seen in Figure 2, Drawing II. The diameter of the main chimney, see Drawings I., III., IV., and VI., must be calculated according to the known formula for fixing the diameter of the chimnies; that formula may be given as follows :—Log : D = $^1/_5$ (2 Log A + log K + log L—log H × a × t) in which,

D represents the required diameter.

A, the volume of gas which the chimney receives per second, videlicet, three hundred and ninety-three cubic feet.

K, the coefficient of the friction of the sides in bricks, videlicet, 0·042 feet.

L, the development of the pipes leading to the chimney, videlicet, seventy-seven pounds.

H, the height of the main chimney, viz^t, three hundred and twenty-eight feet.

a, the coefficient of dilatution of the gases, viz^t, 0·0123 feet.

t, the temperature, which is at six hundred and thirty-six degrees Fahrenheit, in the conditions of the best draught, and which is restored to the cold gases when they reach the main chimney, by the action of the fire placed at about ninety-eight feet from the ground.

By the calculation, the formula of the main chimnies would be twenty-nine feet for the diameter, that for the running of the gases fourteen feet, the mean proportion of which $\frac{43}{2} = 21{\cdot}50$. The mean of the surfaces would be for the surface or circle D 200·8 square feet, and for the running surface 14 feet equals forty-nine feet, which will give for mean $\frac{249{\cdot}8}{2} = 124{\cdot}54$ feet, which surface of 124·54 feet has for diameter 23 feet, and for the side of the square 20·2 feet. Experience has proved that it is always advantageous to increase (in small

proportions however) the quantities obtained by calculation relating to the chimnies; it is therefore more certain to take twenty-three feet as the side of the square, see Drawing V. In case of a main draught chimney being internally circular, two dimensions are necessary, see Drawings I. and III.; one of twenty-three feet at its basis, and the other of 19·2 feet in diameter at the basis; those calculations, however, cannot be rigorously exact, and they give only approximate numbers; besides, those dimensions must be modified, when applied according to the the necessities, and the extension of the streets worked by a main chimney.

The number of inhabitants of the city of London exceed one million five hundred thousand; moreover, the cellars existing under a part of the streets, the gas and water conducts, and the drains, would render, perhaps, the canalisation difficult for the present system, if the smoke of sixty thousand chimneys of private dwellings were to be directed to a single main chimney. In that case the following basis could be adopted, namely, two millions the number of inhabitants; four hundred thousand the number of fires, at the rate of five inhabitants per fire, ten main chimnies would be constructed to serve each of the forty thousand fires, (one third part of the houses having no fires,) which would reduce the number of private stoves served by a main chimney to twenty-seven thousand; that new division would very much simplify the system of laying the street pipes. It will be easy also to vary the dimensions of the main draught chimnies, according to the disposition of the districts, and the number of fires which are to send their smoke to them. All those questions will be easily answered in case of application; but it was necessary to lay down calculations, and to facilitate the developement of the system.

It has been herein-before stated, when speaking of the dimensions of the sheet conduct pipes, that the highest temperature of the gases of the chimnies was six hundred and thirty-six degrees of Fahrenheit, and that the corresponding velocity to that temperature was about twenty-six feet; it now remains to ascertain the velocity which the main chimney would give to the gas. The formula given by several experiments upon the velocity of the egress of burnt air into the chimnies is $\frac{\overline{v^{2g}\ \mathrm{H},\ a,\ t,\ \mathrm{D}}}{\mathrm{D} + 29\ \mathrm{K},\ \mathrm{L}}$ in which V is the velocity of egress per second, produced by the main chimney, and the fire; g is the weight = 21·8; H, the height of the chimney = three hundred and twenty-eight feet; a, the coefficient of dilation of the gases = 0·0123 feet; t, the temperature of the burnt air in the chimney = six hundred and thirty-six degrees Fahrenheit; D, calculated diameter or side = twenty-three feet; K, the coefficient of friction of the brick sides = 0·414; L, the

length of the pipes served by a chimney = 77 pounds. The formula therefore becomes V =

$$\sqrt{\frac{43 - 26 \text{ lbs.} \times 328 \text{ feet} \times 0{\cdot}0123 \text{ feet} \times 63{\cdot}6^{\circ} \text{ Fahrenheit} \times 23 \text{ feet}}{23 \text{ feet} \times 43{\cdot}26 \text{ lbs} \times 0{\cdot}040 \text{ feet} \times 114{,}800{,}000 \text{ feet}}}.$$

That velocity is insufficient; the velocity as before stated, viz^{t},

$$26 \text{ feet} - 4{\cdot}16 \text{ feet} = 21{\cdot}74 \text{ feet},$$

expresses the velocity which the ventilating apparatus must give to the products of combustion of the forty thousand chimnies.

It has been herein-before stated that each private chimney ought to have a diameter of about three inches, and a section of about nineteen and a half inches square, but that such dimensions were given only because the gases in those conduct pipes were hot, and the smoke deposited in them the greatest part of its soot; it has been also demonstrated that the volume of smoke of forty thousand chimnies was, per second, twenty-six thousand four hundred and twelve gallons. The mean density of the gases and vapours egressing from a chimney is 1·66 pounds per 3·280 cubic feet, and 393·60 cubic feet × 1·66 pounds = 198·45 pounds; this last quantity will represent the weight of the volume of gas and vapour which arrive per second in the main chimney. The working of the main chimney is obtained by means of the section of the velocity and the weight of the gases: thus, the volume of gases which it can attract = 4·26 feet × 124·6 square feet = 162 square feet. The weight of this volume = 109 pounds × 1·66 pounds = 81·70 pounds. By providing for the difference of 108·45 pounds per second between the amount of work necessary for the attraction, and 81·70 pounds (amount of work obtained from the chimney), we will obtain nearly 117 pounds per second, which is the work to be effected by the ventilator; as a steam horse power of 165 pounds is capable of raising P $\frac{v^2}{2g}$, P being the weight of the gases and vapours which it can raise; v, the velocity of the ventilating apparatus, viz., 21·77 feet; g, the weight or P = 72·76 pounds. By that calculation the number of horse power of the ventilator will be obtained by putting n $\frac{116{\cdot}75}{72{\cdot}70}$ pounds = $1\frac{4}{7}$ lb. Thus, all the required conditions of velocity, egress, and friction being fulfilled and assisted by the draught fire and the main chimney, a ventilator of two horse power at most could serve forty thousand chimnies, burning each of them one pound of coal per hour. Those calculations are based upon all the known experiments made with the greatest care. However, on account of so great an application as that of the present system, it is more prudent and certain to increase considerably the attracting power; therefore, two ventilators serving each of them, twenty thousand chimnies will be placed

in the great main channel under the main chimnies. Those ventilators would have a power which could be raised to ten horse power; they are put in motion by the steam engine, and their transmission of movement is easily understood by referring to Figures 2 and 5 of the Drawing IV.

CONSTRUCTION OF THE STREET CONDUCT PIPES AND OF THE MAIN CHIMNEY.

Figure 1 in Drawing III. shows a complete front view of the main draught chimney, and Figure 2 is a sectional elevation of the same through its main axis, and represents the sections of different elevations; the ventilating apparatus and that of the main fire-place, the several stories or platforms of the upper buildings, as well as several recesses made in the thickness of the wall, can be made use of for establishing an observatory, a station for night guards, and for setting alarm bells, in case of fire in any part of the town. The Figures 3, 4, and 5 of the same Drawing represent different sections of Figures 1 and 2.

In Drawing IV., Figure 2 is a sectional elevation drawn through the middle of Figure 4, which last Figure represents a main draught chimney having a gothic form. Figure 1 represents the main canal for gathering all the smoke in the condensation canal and draught ventilators; the Figure 2 represents the level plan of the building with ground; and Figure 3 is the plan of a story or platform, set at about one hundred feet from the ground, and on which the fires are kept. Figure 1, Drawing V., represents a front view of another main draught chimney, and Figure 2 is a sectional elevation through its main axis; the Figures 3, 4, 5, 6, and 7 are the plans of the different parts of the building. Pipes of eight inches and 1·19 feet in diameter, will be placed in the same manner as gas pipes, and will also be made of cold drawn iron with a bituminous coating, which are far superior to cast iron pipes, both on account of their resistance to pressure, for their durability, and the facility of laying them. The cleaning of those pipes will be easily effected by means of a kind of mop, adapted at will, to an iron rod set at convenient distances, of about three hundred and twenty-eight feet, having small reservoirs to receive dust, soot, and condensed waters. The scavengers will descend at fixed times, and at night before the fires of dwellings are light, and by drawing the rod with the mop along the reservoirs will clean them thoroughly, as is represented in Figure 7, Drawing 1, in which A, A, are the recesses for the reception of the soot, water, &c., which are to be taken away by a small trap-door. O, M, is the rod with a mop to cleanse the conduct pipes; these conduct pipes are slightly inclined, as shewn in the Drawing, in order to facilitate the ingress into the recesses, and afford the means of taking away the

dirt, soot, and water. The pipes of three feet diameter will be also of strong sheet iron, covered by asphalte or any other similar substance, and protected by masonry work; they will be placed at a depth of three feet. The cleansing will be effected by means of holes at convenient distances, at about six hundred feet one from the other; the workman will descend into them, and with brooms of a circular form will effect the cleaning with facility. Some small reservoirs prepared at a proper distance from each other will receive the produce of the cleaning and condensation, see Figure 8, Drawing I., representing a sectional elevation of a conduct pipe. The conduct pipes, having a diameter of seven feet, which carry the products of ten thousand chimneys, being constructed only at the opening of the squares or places, will be made in strong masonry work with stone or bricks and perfectly joined; see Figure 9, Drawing I., which represents a sectional elevation of one of those pipes. Their cleaning will be effected with the same facility as the preceding ones. They will be placed at a depth of nine, twelve, or fifteen feet, and will meet at the top of the vault of the main canal, No serious objection can be made to the cleaning of the pipes, as herein-before described. The sweeping of present chimnies and the attention required to look out to avoid fires in houses, entail more difficulties and require more persons than by the new system. The great main canal, which will contain the ventilators and washing apparatus, has greater dimensions than given by the herein stated calculations, as it serves as a reservoir; it is placed under the main-chimney; its vault set at the bottom of that strong building serves to consolidate the basis of the former. This great main pipe is shut by means of doors made of hard wood, and is provided with a staircase serving for its inspection, see Figure 5, Drawing VI.

Repairing of the Pipes.

Whatever be the cause for cleaning or repairing, the conduct pipe can be always served by the main chimney. When the cleaning or repairing is to be made, a valve of communication between the conduct pipe is opened between the pipe to be repaired and the next pipe; the first pipe will be shut up close to the obstructed part, and when the cleaning and repairing are effected, the former communication of the smoke will be restored. The arrangement of the pipes is therefore such, that any pipe whatever may be always replaced by another, either entirely or partly. As for the main conduct pipes, which contain the gases of ten thousand chimnies, and which are four in number, arriving two by two in the great main channel, they will have also a communication between them, so that their cleaning or repairing does not prevent the general flow of the smoke. The main chimney will be three hundred and

twenty-eight feet high, the side of its interior basis twenty-three feet, and it can have any suitable form of architecture. The hearth for the fire will be placed on one of the several platforms or floorings; the other will serve for the construction of an observatory for the guard-room of watchmen, or for placing alarm bells, &c. &c.; the staircases constructed in the body of the masonry will lead to those several stories. Drawing VII. represents an application of the improvements herein-before and herein-after described to one part of London, and shows by the several arrows the dispositures of the street conduct pipes. This Drawing represents about one-third of the streets which can be worked by one of the main chimneys.

Third Improvement.

This part of the Invention relates to the process of separating the congregated smoke from its carbonic principles, deleterious gases, and noxious vapours. It has been already stated, that for every building a proper flue conducting the smoke into a certain apparatus, as shewn by Drawing II, was to be constructed in the subterranean parts of the building. That apparatus disengages the greatest part of the smoke from the soot; any small quantities which the smoke may still retain are deposited in the other street main pipes. The ammoniacal products, carburetted hydrogen, and sulphurous gases, water, arsenical, and mercurial vapours, &c., &c., produced by manufactories and dwelling-houses, are condensed in small quantities during their passage through the several conduct pipes. The greatest part of these deleterious agents arrive at the main canal or general reservoir. In Drawing VI., Figures 1, 2, & 3 represent the sections according to I, K, A, B, G, H, of the basis of the main chimney, represented by Drawing IV., and show the whole of the apparatus set at the bottom of the said main chimney. In Figures 1, 2, 3, the same letters refer to the same parts; a steam engine of forty-five to fifty horse power giving motion, firstly, to the draught ventilators; secondly, to the washing wheels; thirdly, to the exhaust pumps; fourthly, to the machine for raising the fuel for feeding the fires of the hearths. B is the washing wheel; C, C, represent the draught ventilators propelling the gases in an opposite direction to the shower of water thrown out by the washing wheels; D, D, are the reservoirs, the water of which drops in small continuous streams on the washing wheels; those reservoirs let the water fall on the wheels only in a surface or sheet of water of 9·84 feet long and large, by means of perforated spouts; E, E, E, E, are the escape conducts, for the egress of the smoke which they receive from the street iron pipes.

Those escape conduits are constructed in masonry works, and are built at a

small distance from the principal or main canal, which is placed under the bottom of the main draught chimney; F, F, are the wells, the sections of which, according to I, K, Figure 2, and according to C, D, Figure 5, shew the use and the construction of the apparatus for transmitting motion to the wheels, and the mode of working them for the exhaustion of the waters in the draining wells; G, G, are the wells used for the room or apartment necessary for the apparatus, transmitting motion to the ventilators; I, I, are basins or reservoirs placed under the wheels, wherein the waters used for the washing meet, and thence fall into the draining wells J, J; J, J, are the draining wells, the waters of which are drawn out by means of the pumps placed at about thirty-three feet above them; K is the vault serving as access to the several parts of the apparatus and great canal. Figures 4 and 5 contain the longitudinal and transversal sections of a washing wheel, its transmission of movement, the reservoir for the washing serving to work the wheels, the internal reservoir, its overfall, and finally, the vault for the service.

In Figure 4, B represents the washing wheel in its working position and provided with the paddles, the radii of which are 9·84 feet; D is the basin from which the water is sent on to the paddles of the wheels B; H is the axis of the wheel set on its bearings.

In the main canal, and close to the draught ventilator herein-before described, the large wooden wheels B, B, are placed; their velocity is forty revolutions per minute. These wheels B, B, are 19·68 feet in diameter; one point of their circumference turns therefore $\frac{2\,3\,6\,1}{6\,0}\,\frac{\text{feet}}{\text{sc.}} = 39{\cdot}36$ feet per second. The reservoirs D, D, fed by the water coming from above, are set at a short distance from the upper extremity of the wheels B, B. These reservoirs or basins are provided with three thousand holes, about one inch in diameter. The distance of the opening for the egress of the water to the level of the water's surface is one inch; the velocity of flowing on account of the elevation is therefore to the orifice of egress as follows:—$V^2 = 29^h = 63{\cdot}28 \times 3$ or $V = 25$ feet per second.

The difference of the velocities 39·36 feet — $25\,^{\text{feet}} = 14$; 36 feet shews the velocity with which the rain will fall amidst the gases and vapors.

To find the number of rotations performed by the wheels B, B, and to express it in horse power, the action of the water upon the wheel must be ascertained.

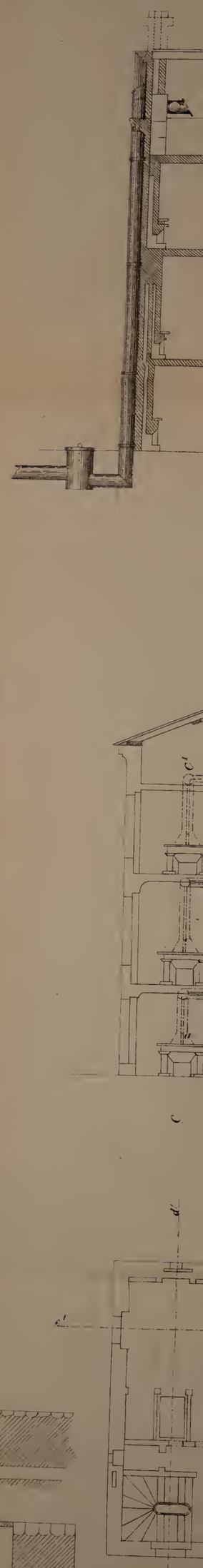
Now, an orifice of one-tenth of an inch with a velocity of twenty-five feet per second necessitates a flow of water of 0·000568 feet, and three thousand orifices will exhaust five feet, therefore there will be a fall of two hundred and seventy-four pints of water upon the wheel per second; five horse power per wheel will be quite sufficient to work the wheels B, B, and the steam engine shewn in Figure 2, Drawing VI., will easily provide for that power.

Those cleansing wheels when put in motion will remove the greatest part of the deleterious gases and vapors; the gas will arise afterwards and be submitted to the combustion of the fires. The main fire is set at about one hundred feet above the ground, and is composed of small fires fed with coke, the heat of which serves also for the boilers of the steam engine, and afterwards proceeds to a large pipe set in the centre of the main chimney. The platform or floor on which is set the fire is provided with a large iron grating, on which the gases arising from the coal burnt in each of the separate fires of the private dwellings will be consumed. At the same place an apparatus for producing a powerful light is constructed; it is put in motion by the steam engine, and will emit a brilliant light through the mouldings, and also add to the handsome aspect of the main draught chimney. The gases which rise in the main chimney, after being submitted to the cleansing action of the wheels B, B, set in motion as herein-before described, will be freed of their last deleterious principles, by passing through the large pipe set as herein-before stated in the centre of the main chimney. The heat of this pipe will give to the gases the necessary temperature, and when egressing from the chimney they will be fully purified and colorless, and in a fit state to be mixed with the external air, which they can no longer injure or pollute, having by the several herein-before described operations been entirely deprived of all their noxious qualities. The Figure 3, in Drawing II., shews a sectional elevation of the fifteen horse power steam engine, serving to raise the coke for feeding the fires placed, as stated before, on one of the floors of the main chimney; in that Figure A represents the steam engine, and B a wooden wheel.

From what has been herein-before described, the importance of the Invention can be easily understood, and the immense advantages arising from its adoption will not fail to attract the attention of the economist. The entire dispersion and disparition of the smoke in large towns, its complete suppression in the interior of houses, the small outlay required in every dwelling for the erection of the necessary apparatus, and the economy of three-fifths in the combustion of the fuel, are of the greatest moment for every member of society, and render nearly imperative the adoption of the Invention.

And having now described the nature of the Invention communicated to me, and the means of performing the same, I wish it to be understood that I do not confine myself to the precise details either in the construction of the several apparatus and machinery, or in the several calculations laid down to direct the operations, nor to the exact modi operandi; nor do I claim as the Invention communicated to me any separate part of the several component parts of the apparatus or machinery, provided the general features of the mechanical

Fig 2.



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(7 SHEETS)
DRAWING 1.

Fig. 1ª

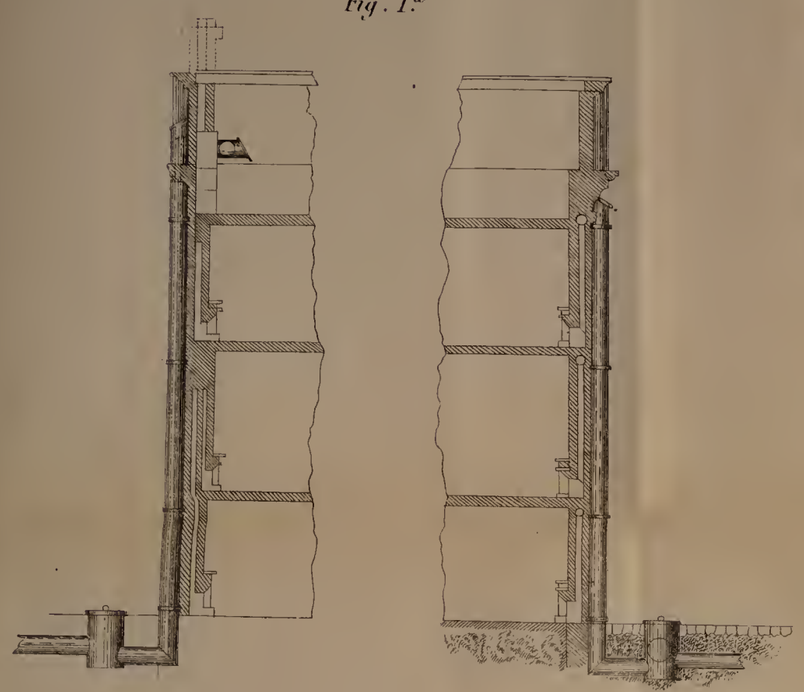


Fig. 6.

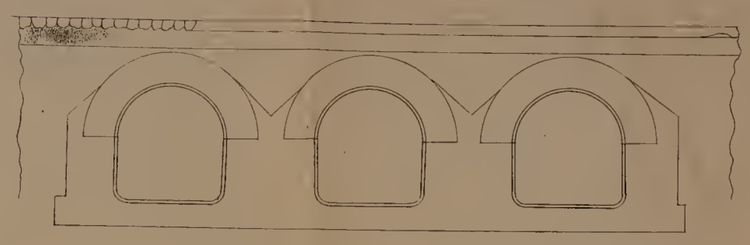
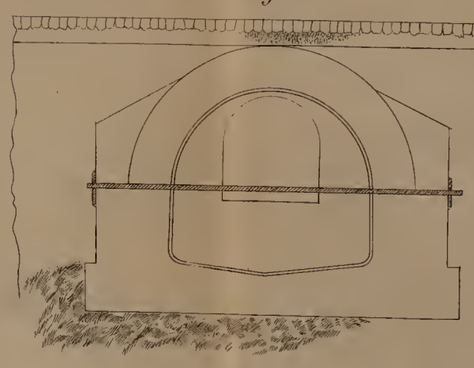


Fig. 5.



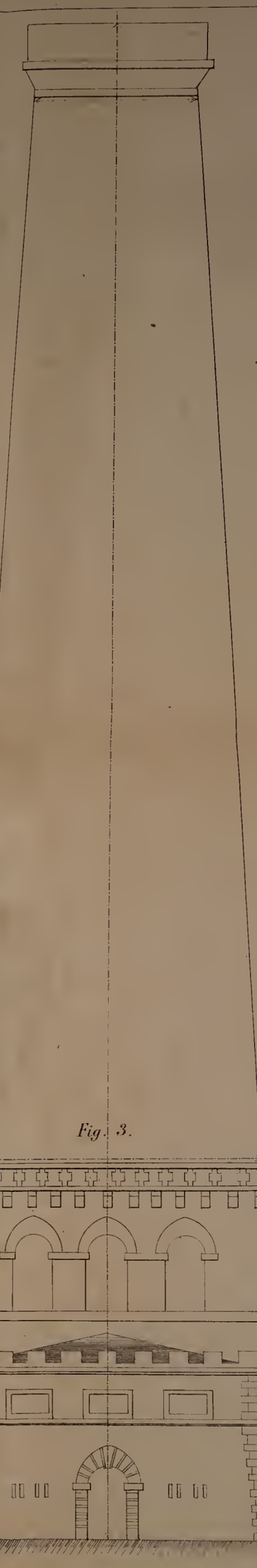


Fig. 3.

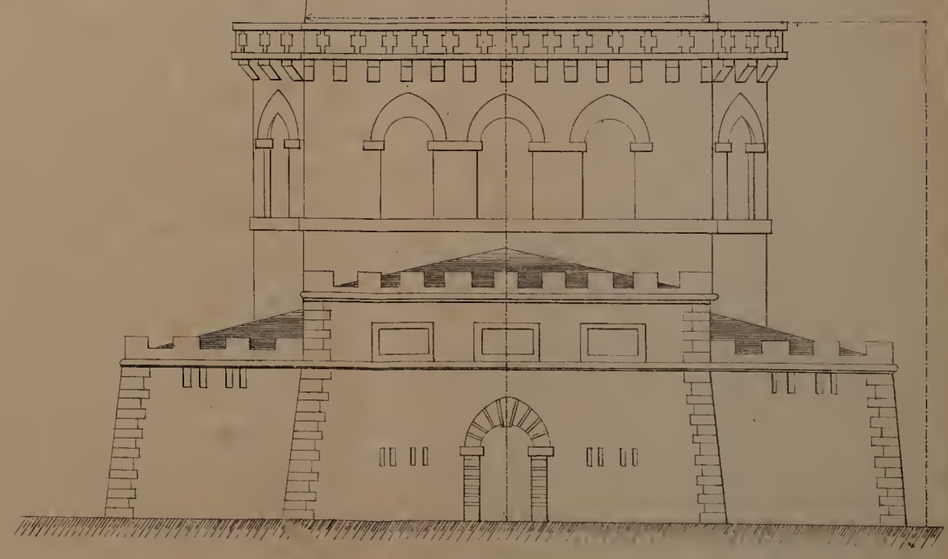


Fig. 1.

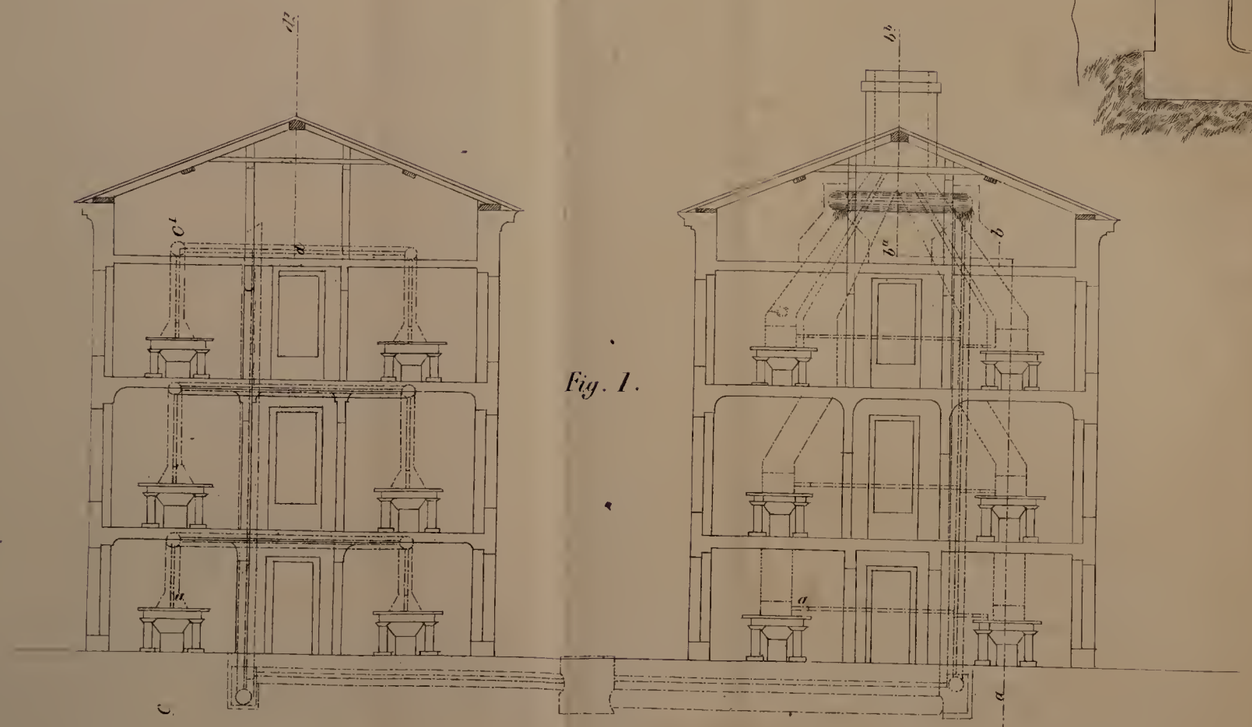
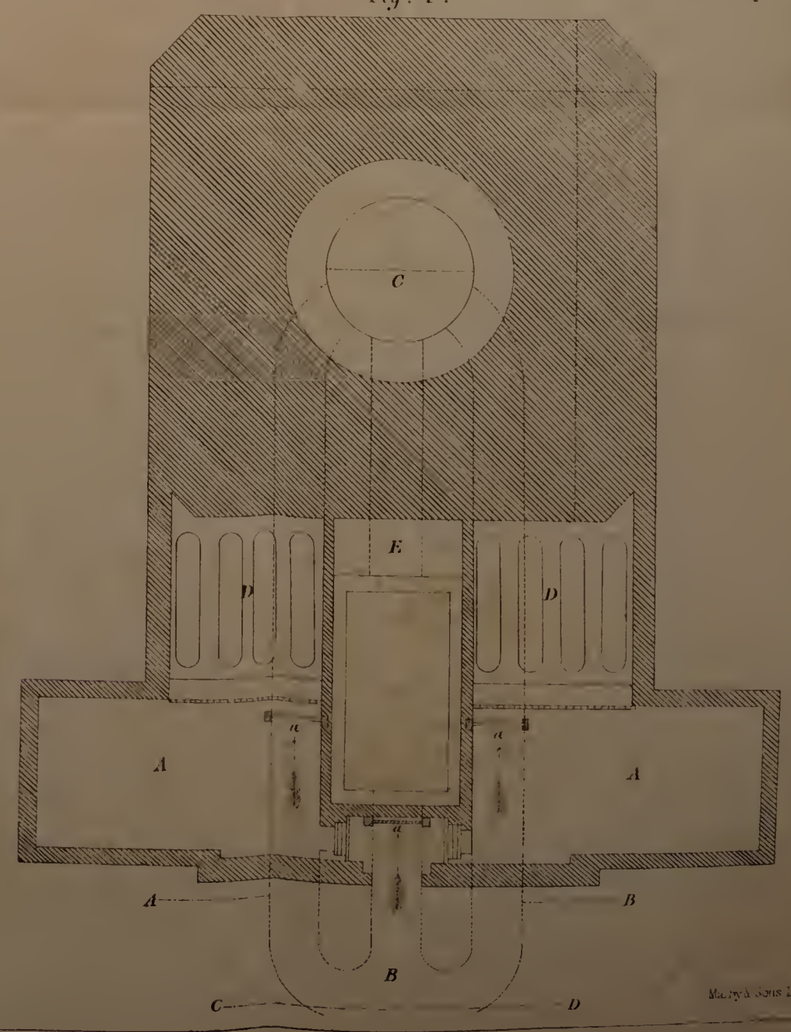
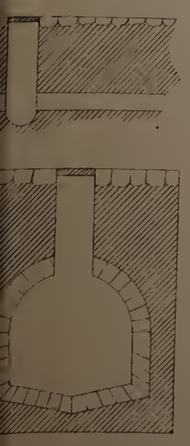


Fig. 4.





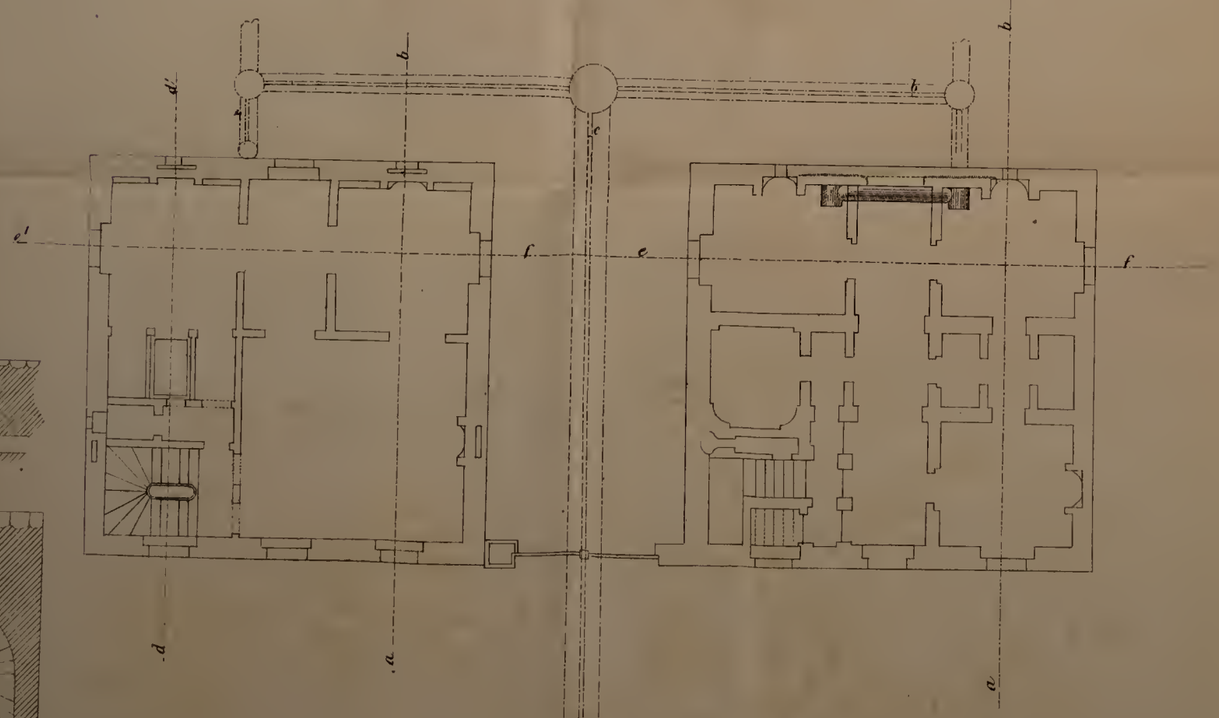


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FIG. 6

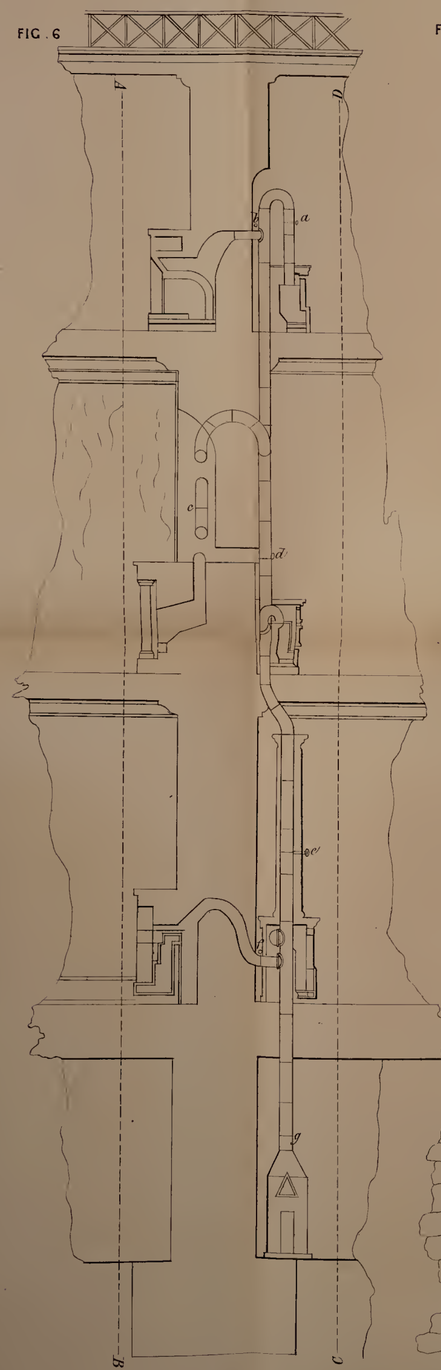

FIG. 5

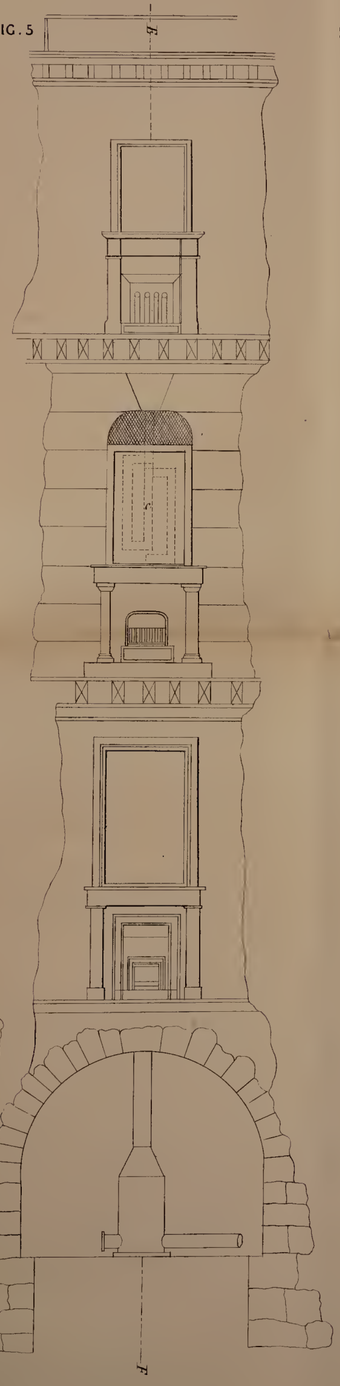

FIG. 4.

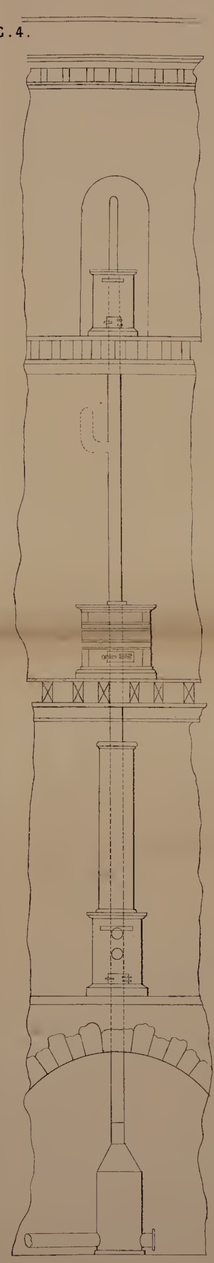

FIG. 1

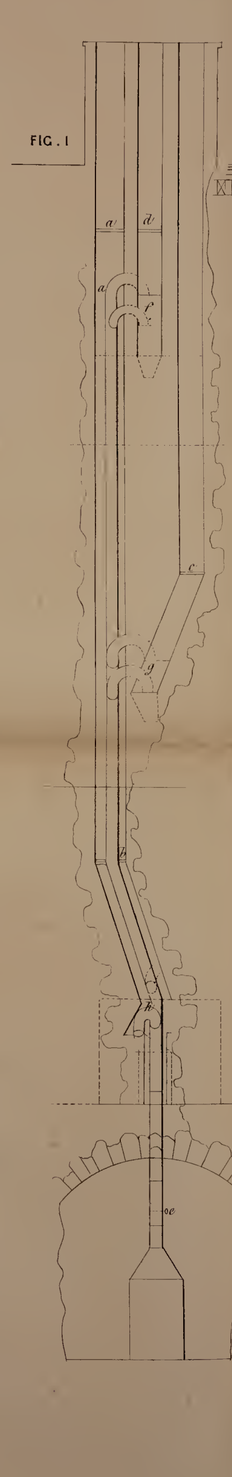

FIG. 2

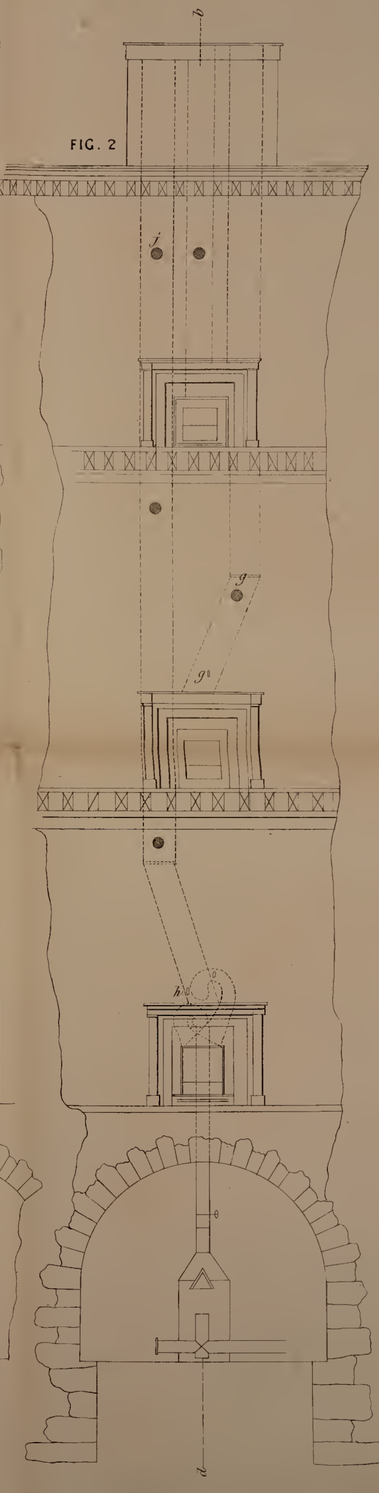

FIG. 3

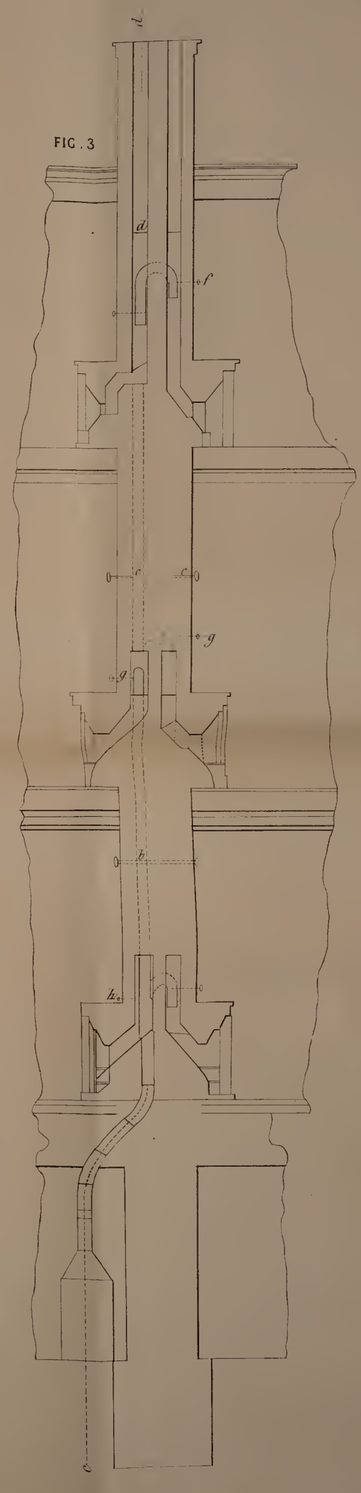

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FIG. 1

FIG. 2

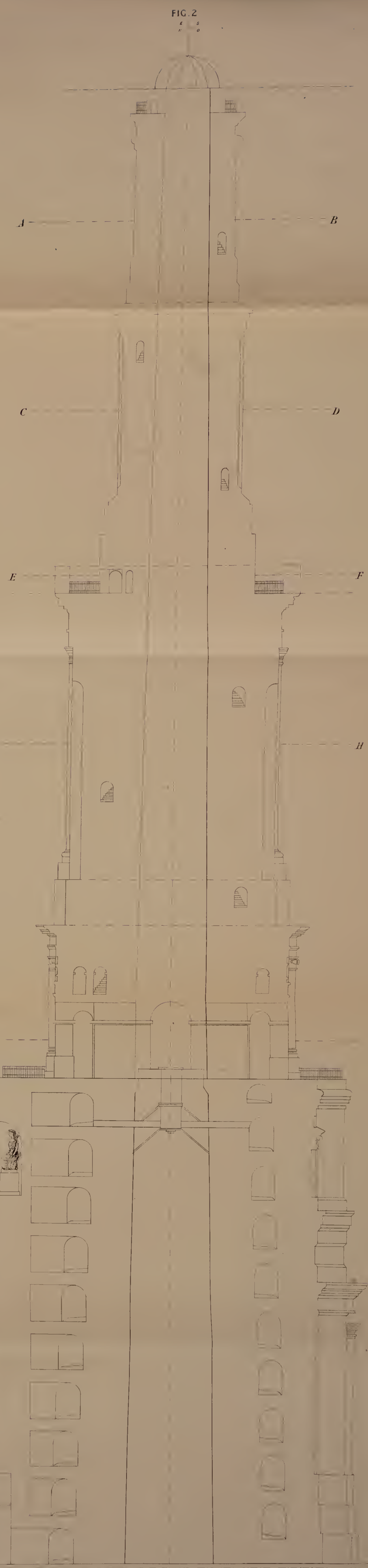


FIG. 5

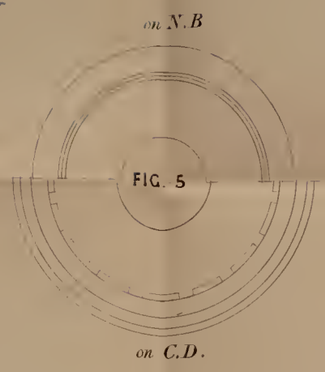


FIG. 4

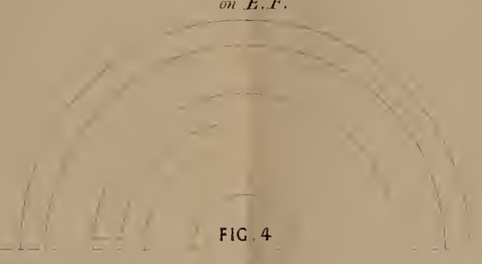
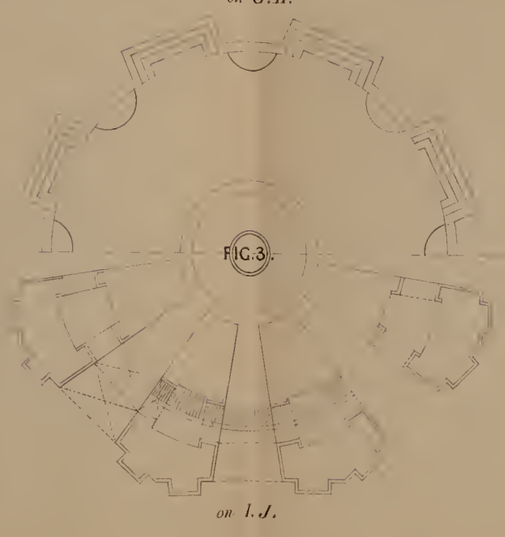


FIG. 3.



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FONTAINEMOREAU'S SPECIFICATION

120 (7 SHEETS.) DRAWING 4.

FIG. 1.

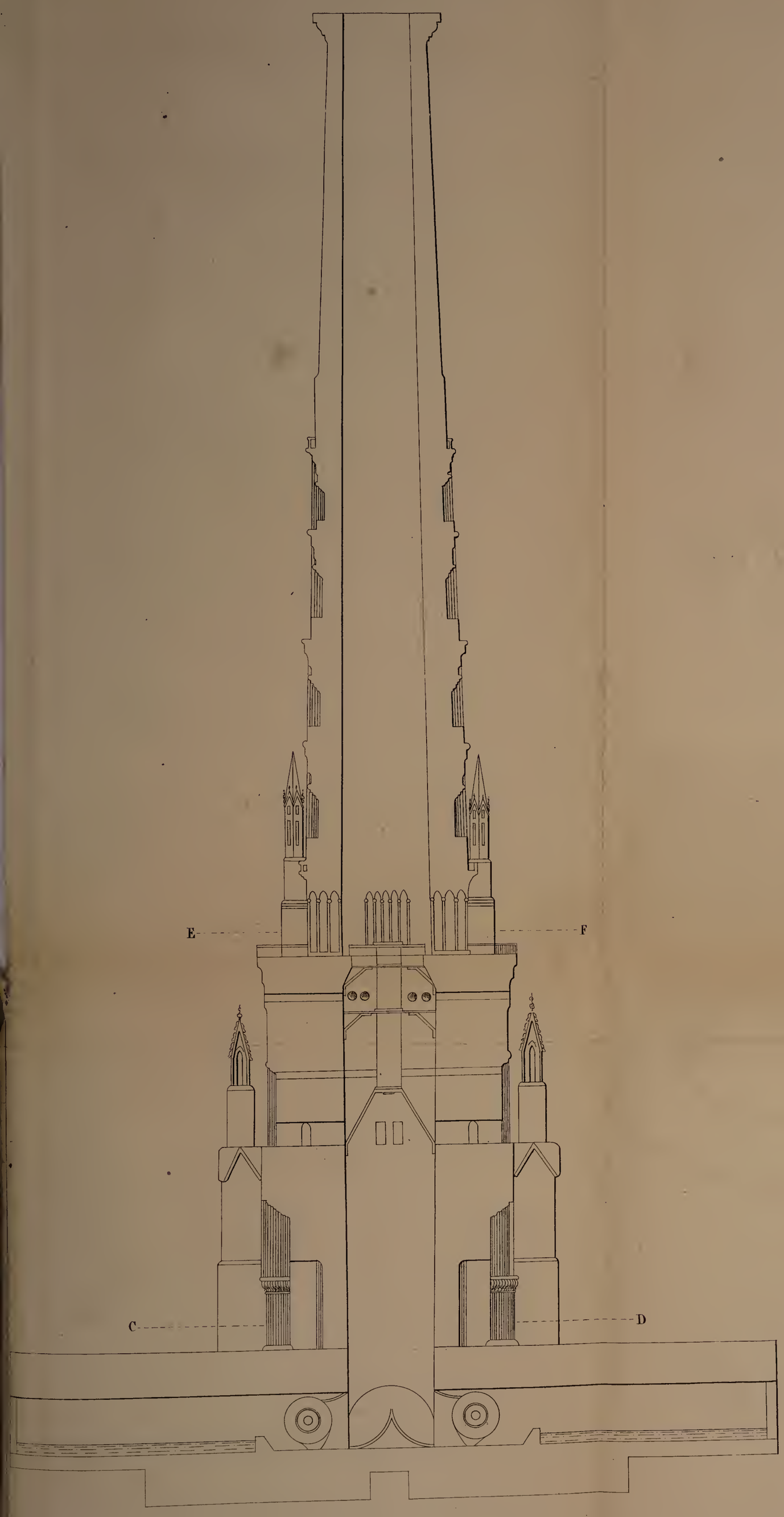


FIG. 4.

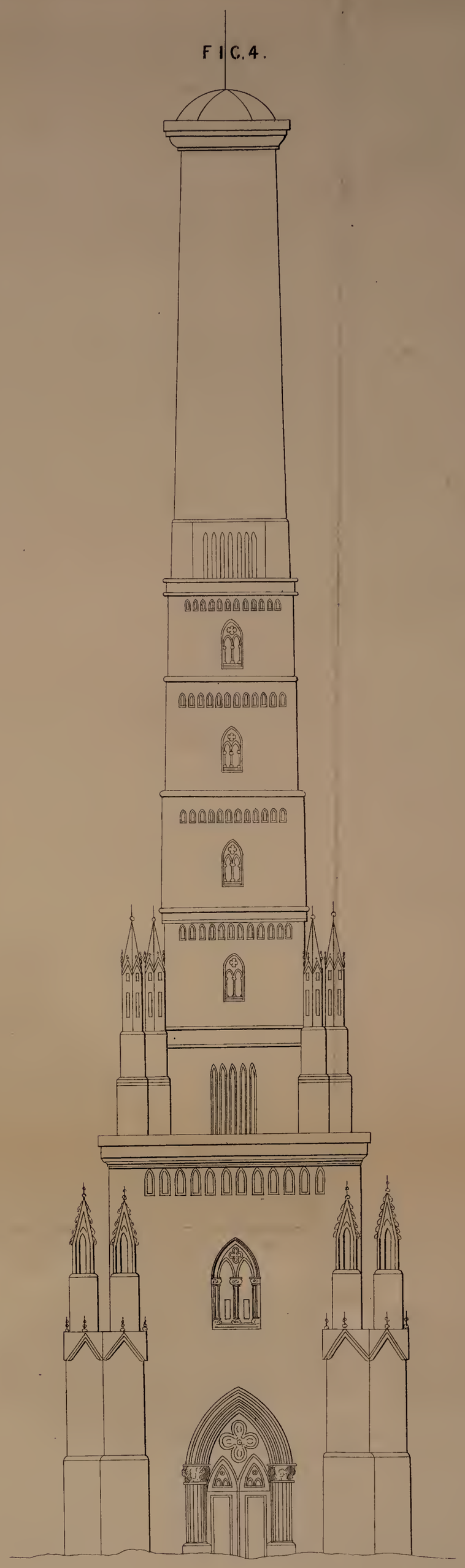


FIG. 2.

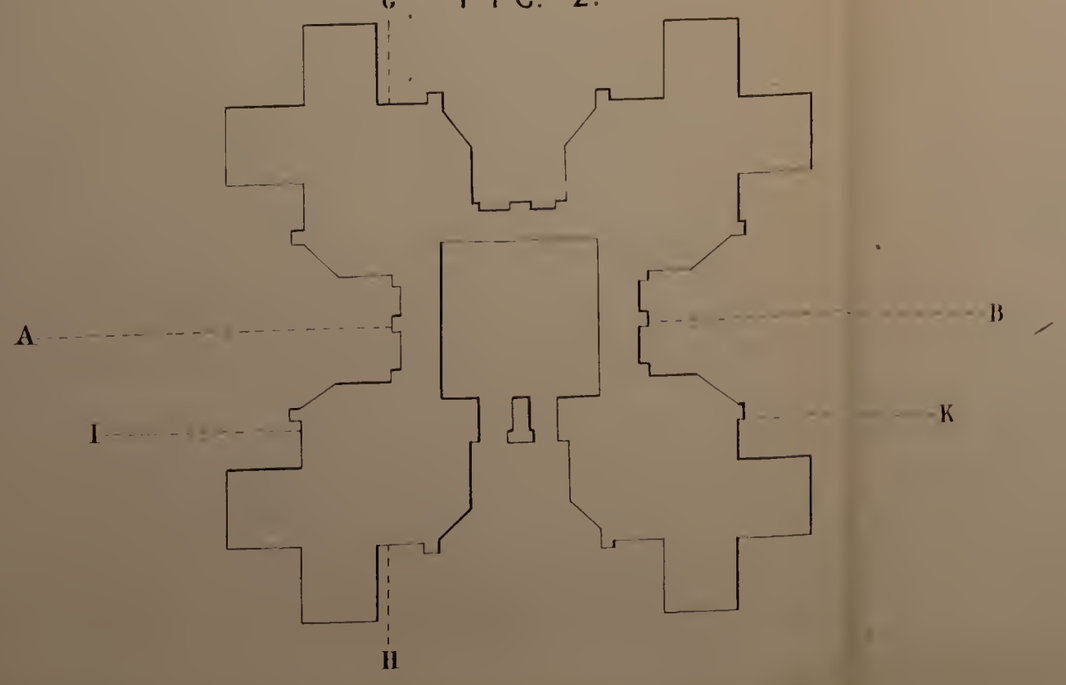
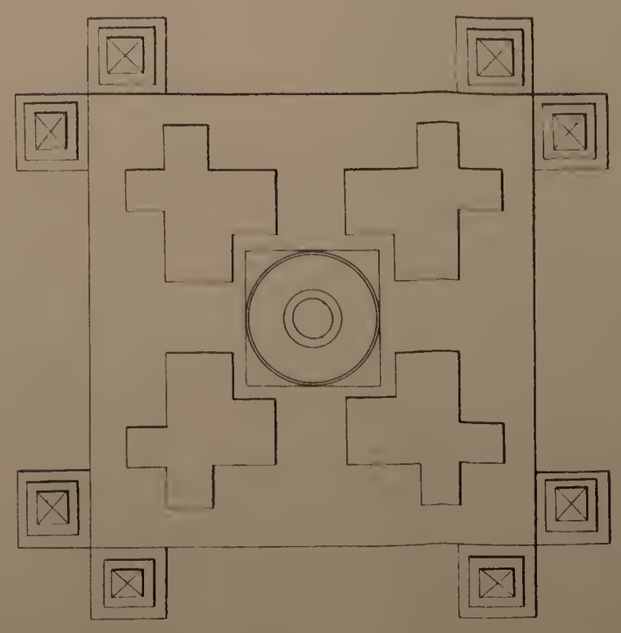


FIG. 3.



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(7 SHEETS)
DRAWING 5.

FIG. 1.

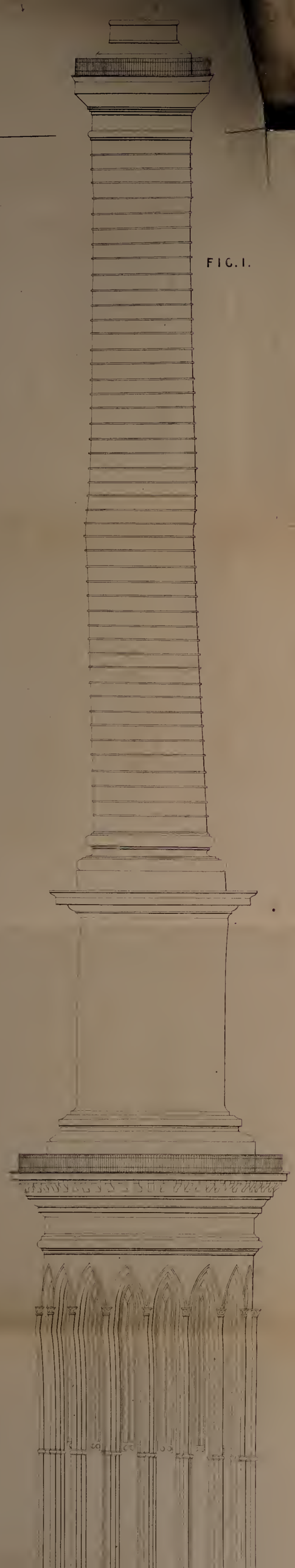
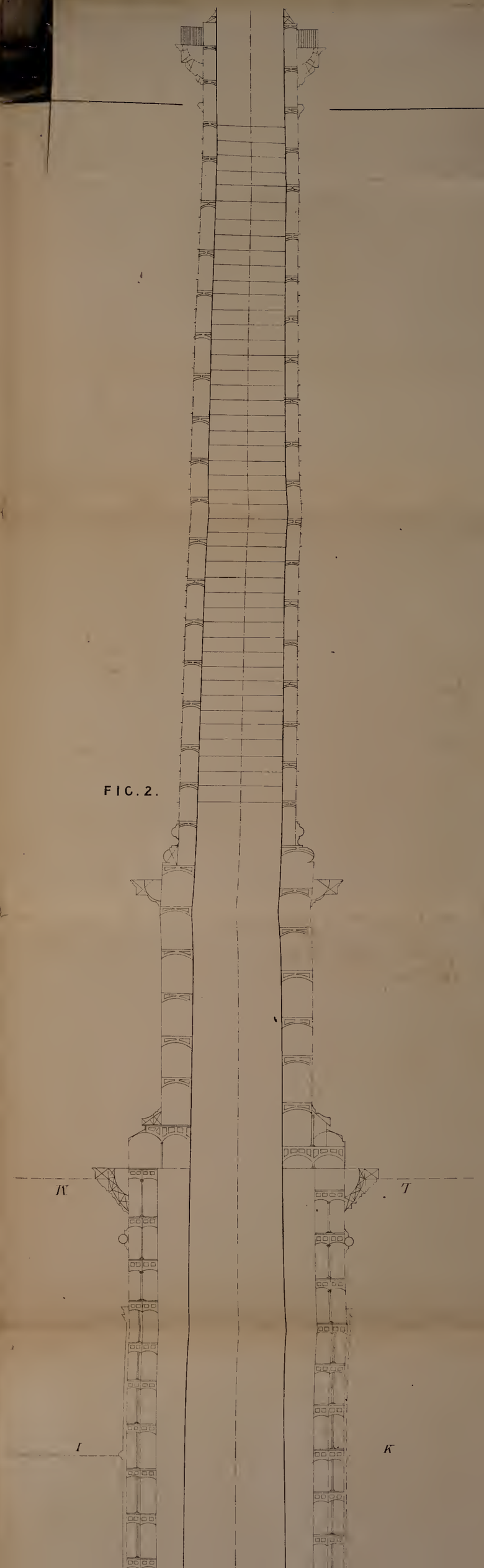


FIG. 2.



Plan at L, M.

FIG. 8.

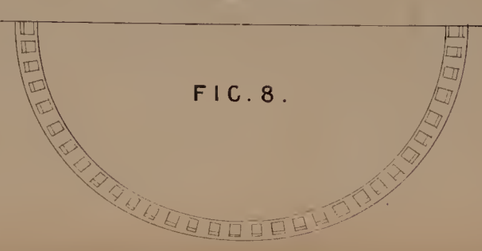
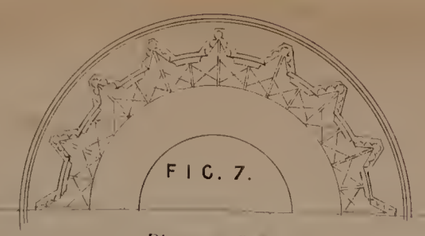


FIG. 7.



Plan on I, K.

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The marked dimensions is parts referred

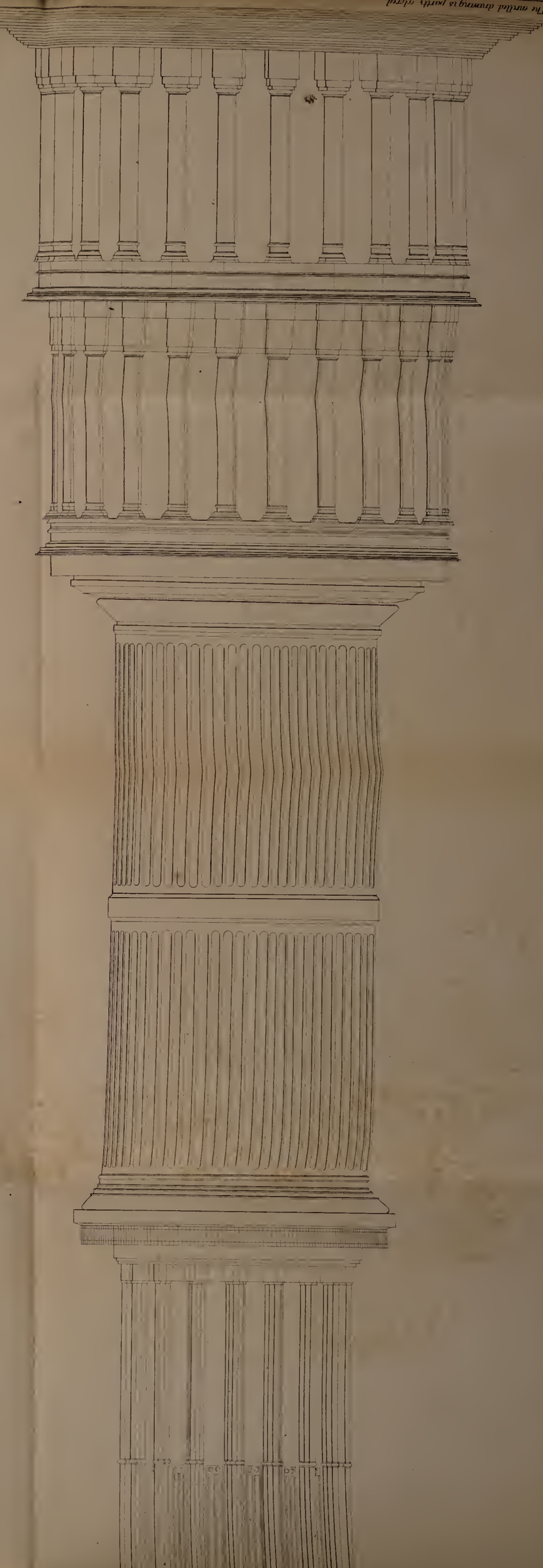


FIG. 3.

Plan on A.B.

FIG. 4.

Plan on C.D.

FIG. 5.

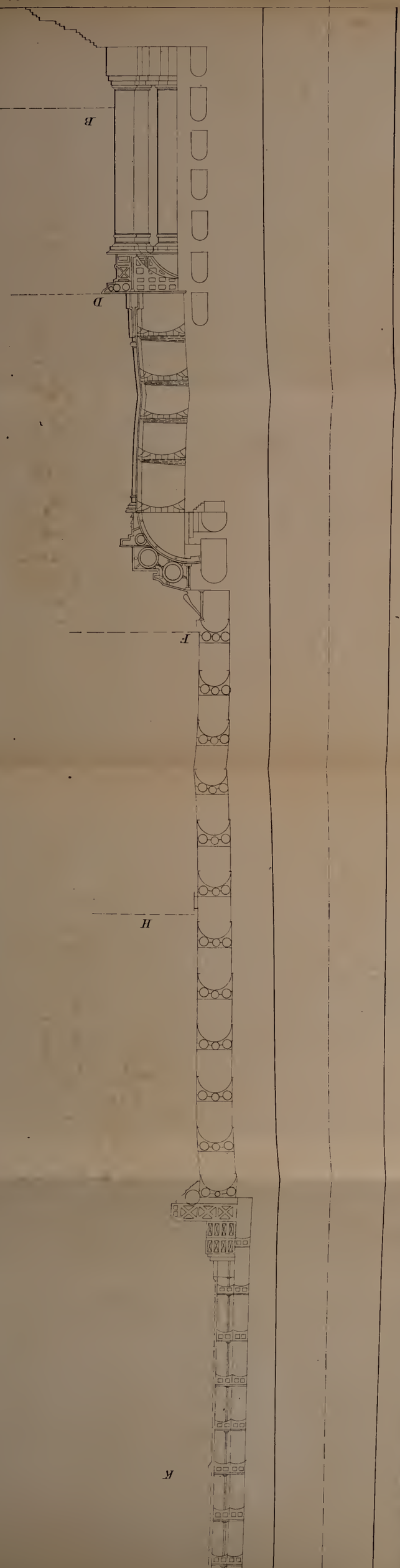
Plan on E.F.

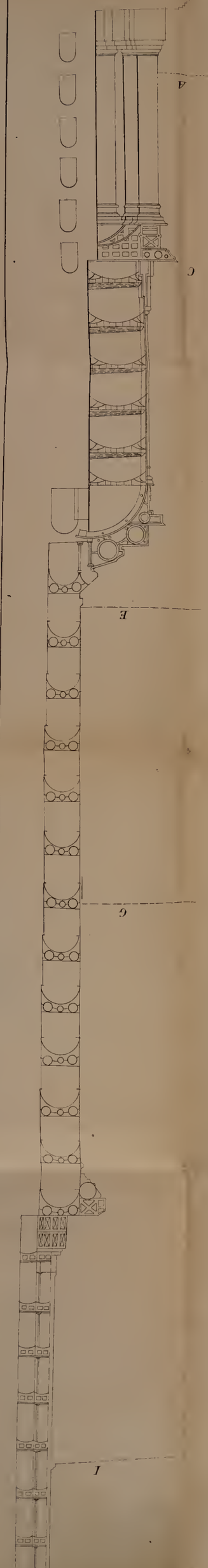
FIG. 6.

Plan on G.H.

FIG. 7.

Plan on I.K.





121

FIG. 2

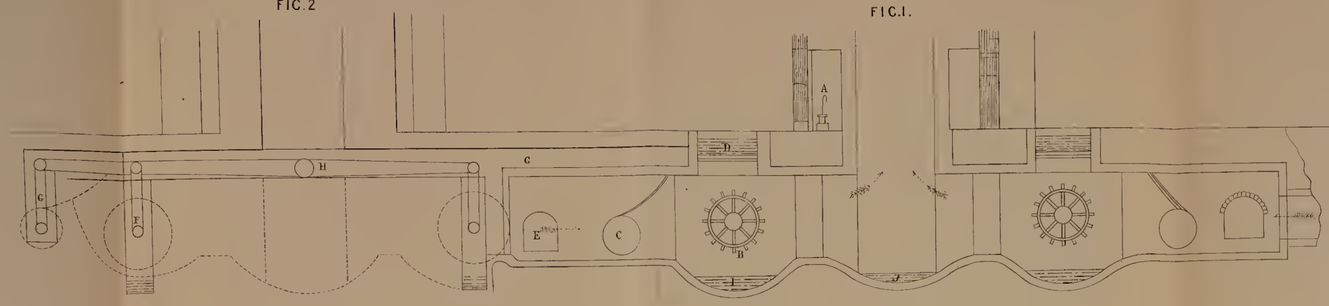


FIG. 1.

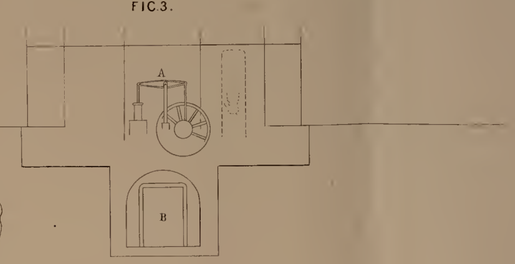


FIG. 3.

FIG. 4.

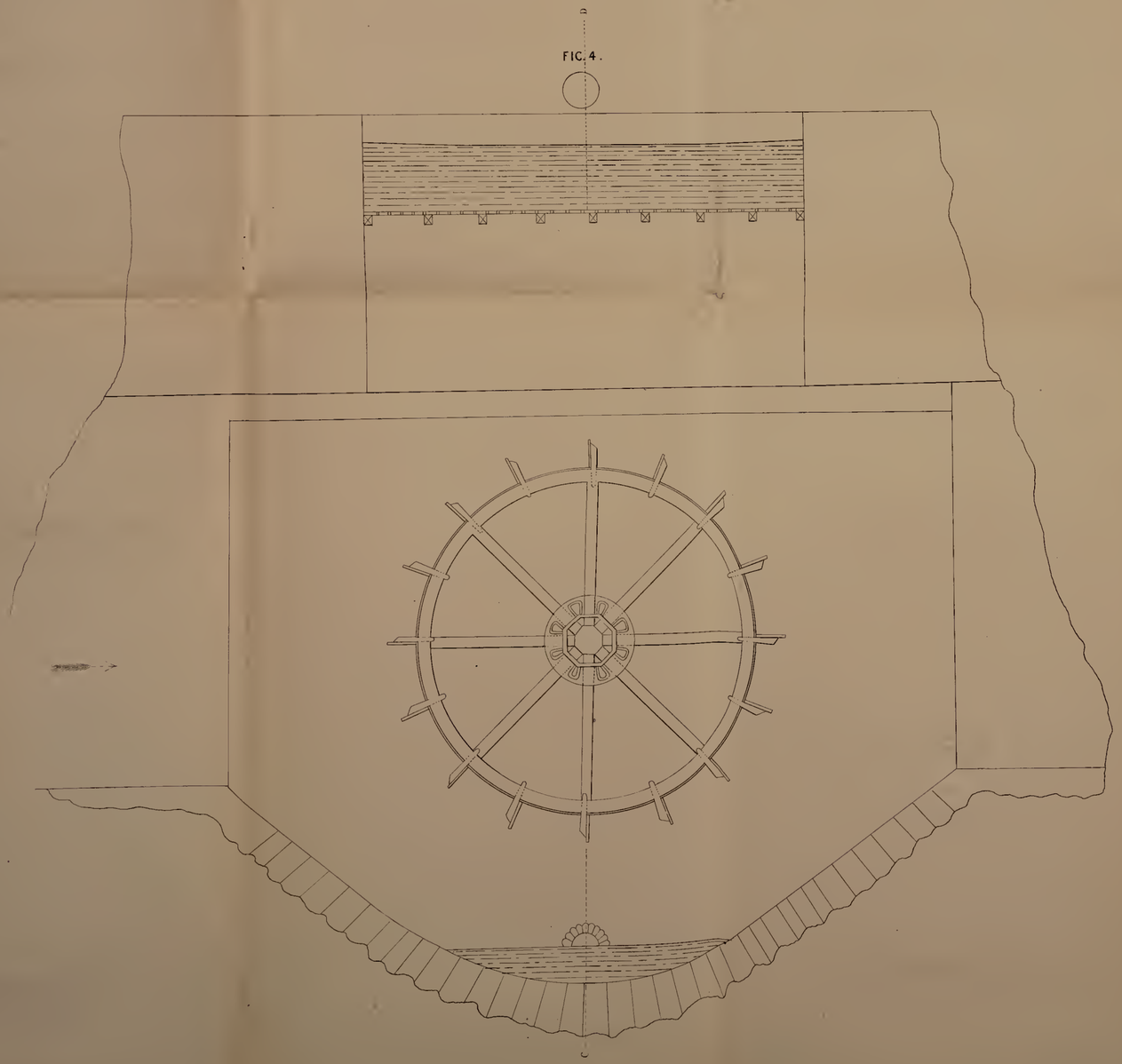
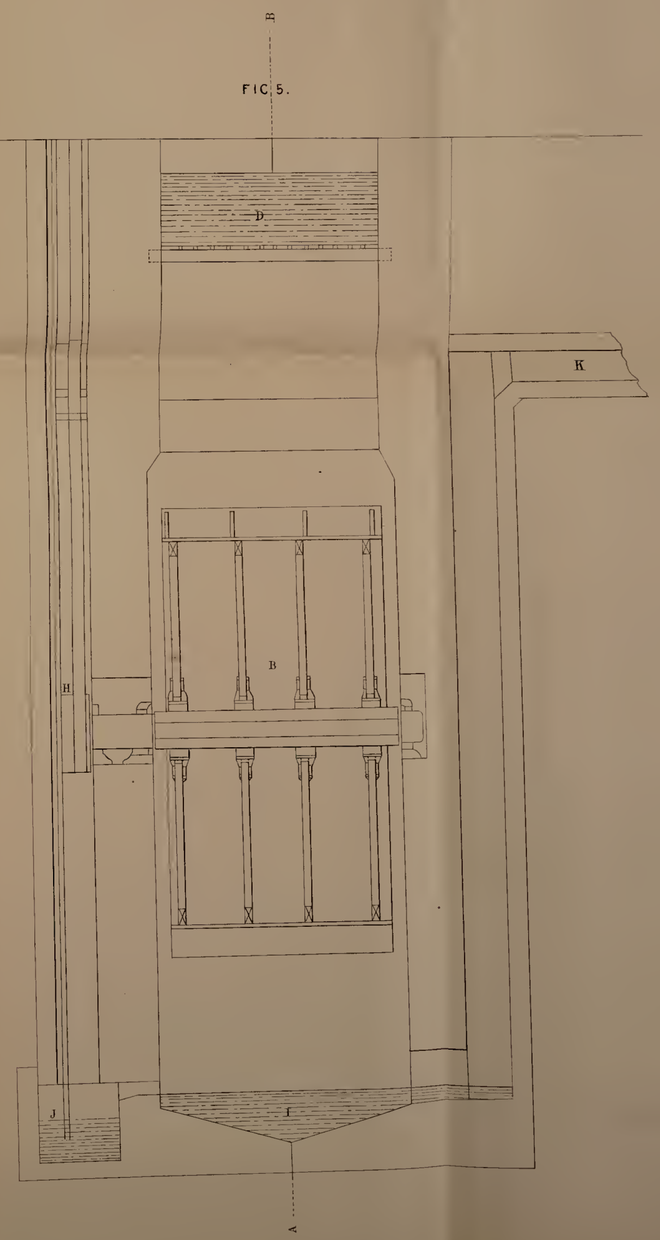


FIG. 5.



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A. D. 1850. April 23. N° 13061.
FONTAINEMORE'S Specification.

(7 SHEETS)
DRAWING 7.

The dotted drawing is extend

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arrangements and of the system for carrying out the Invention be preserved. But what I claim as the Invention communicated to me, and intended to be protected by the herein in part recited Letters Patent, is,—

Firstly, the mode of conducting by a system of conduct pipes the smoke from every private dwelling to a general reservoir, as herein-before described, reference being had to Figures 1, 1ª, 2, 3, and 5, Drawing I.; Figures 1, 2, 3, 4, 5, and 6, Drawing II.; Figure 1, Drawing IV.; and Drawing VII.

Secondly, the mode of conducting smoke by means of pipes from the rooms of private dwellings to an apparatus under ground, in connection with street pipes, as herein-before described, reference being had to Figures 1, 1ª, 2, 3, 4, 5, & 6 of Drawing I.; Figures 1, 2, 3, 4, 5, and 6 of Drawing II.

Thirdly, the mode of conducting, by a system of pipes set under ground, the smoke from dwelling-houses to a general reservoir placed under a main draught chimney, as herein-before described, reference being had to Figures 1, 1ª, 2, and 6, Drawing I.; to Figures 1, 2, 3, 4, 5, 6, Drawing II.; to Figure 2, Drawing V.; and to Figure 1, Drawing VII.

Fourthly, the application of machinery for disengaging smoke from its deleterious components, as herein-before described, reference being had to the Figures 1, 2, 3, 4, 5, 6, Drawing II.; and to Figures 1, 2, 4, 5, Drawing VI.

Fifthly, the consuming smoke in large draught chimnies, as herein-before described, reference being had to the Figures contained in Drawings III., IV., and V.

In witness whereof, I, the said Pierre Armand Lecomte de Fontaine Moreau, have hereunto set my hand and seal, this Nineteenth day of October, in the year of our Lord One thousand eight hundred and fifty.

L' DE FON (L.S.) TAINE MOREAU.

AND BE IT REMEMBERED, that on the Nineteenth day of October, in the year of our Lord 1850, the aforesaid Pierre Armand Lecomte de Fontaine Moreau came before our said Lady the Queen in Her Chancery, and acknowledged the Specification aforesaid, and all and everything therein contained and specified, in form above written. And also the Specification aforesaid was stamped according to the tenor of the Statute made for that purpose.

Enrolled the Twenty-third day of October, in the year of our Lord One thousand eight hundred and fifty.

CROSBY.

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